

Claims

I claim:

- 5 ~~Sub 1~~ A network device-based method comprising:
determining, upon receiving acknowledgement
of receipt of new data, an excess number of
duplicate acknowledgements based upon a count of
consecutive duplicate acknowledgement packets;
10 taking a network packet transmission recovery
action based upon said excess number of duplicate
acknowledgements; and
storing said excess number of duplicate
acknowledgements as a number of duplicate
15 acknowledgements.
2. The network device-based method of Claim 1
further comprising:
determining whether a congestion window is
20 inflated prior to said determining an excess
number of duplicate acknowledgements.
3. The network device-based method of Claim 1
wherein said taking a network packet transmission
25 recovery action further comprises:
deflating a congestion window upon said value
of said excess number of duplicate
acknowledgements in bytes being less than a number
of bytes in a transmission control protocol sender
30 segment.
4. The network device-based method of Claim 1
wherein said taking a network packet transmission
recovery action further comprises:
35 optimizing a size of a congestion window to
match a reduction in a quantity of unacknowledged
data upon said excess number of duplicate

acknowledgements being greater than a TCP sender segment.

5 5. The network device-based method of Claim 1
wherein said taking a network packet transmission
recovery action further comprises:

comparing said excess number of duplicate
acknowledgements with a duplicate acknowledgement
threshold.

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6. The network device-based method of Claim 5
wherein said taking a network packet transmission
recovery action further comprises:

performing a fast retransmit upon said
comparing said excess number of duplicate
acknowledgements with a duplicate acknowledgement
threshold indicating that said excess number of
duplicate acknowledgements is greater than or
equal to said duplicate acknowledgement threshold.

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7. The network device-based method of Claim 6,
wherein said taking a network packet transmission
recovery action further comprises:

analyzing a size of a congestion window.

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8 The network device-based method of Claim 7,
wherein said taking a network packet transmission
recovery action further comprises:

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resizing said congestion window upon said
analyzing said size of said congestion window
showing said size is greater than a predefined
size.

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9. The network device-based method of Claim 5,
wherein said taking a network packet transmission
recovery action further comprises:

analyzing a size of a congestion window upon
said comparing said excess number of duplicate
acknowledgements with a duplicate acknowledgement
threshold indicating that said excess number of
5 duplicate acknowledgements is less than said
duplicate acknowledgement threshold.

10 The network device-based method of Claim 9,
wherein said taking a network packet transmission
10 recovery action further comprises:

resizing said congestion window upon said
analyzing said size of said congestion window
showing said size is greater than a predefined
size.

15 11. The network device-based method of Claim 1
wherein said method is included in Transmission Control
Protocol congestion avoidance.

20 12. A network device-based method comprising:
determining, upon receiving acknowledgement
of receipt of new data, an excess number of
duplicate acknowledgements based upon a count of
consecutive duplicate acknowledgement packets;
25 deflating a congestion window upon said value
of said excess number of duplicate
acknowledgements being less than a transmission
control protocol sender segment;
optimizing a size of said congestion window
30 to match a reduction in a quantity of
unacknowledged data upon said excess number of
duplicate acknowledgements being greater than a
transmission control protocol sender segment; and
storing said excess number of duplicate
35 acknowledgements as a number of duplicate
acknowledgements.

13. The network device-based method of Claim 12 further comprising:

5 comparing said excess number of duplicate acknowledgements with a duplicate acknowledgement threshold upon said excess number of duplicate acknowledgements in bytes being greater than a number of bytes in a TCP sender segment.

10 14. The network device-based method of Claim 13 further comprising:

15 performing a fast transmit upon said comparing said excess number of duplicate acknowledgements with a duplicate acknowledgement threshold indicating that said excess number of duplicate acknowledgements is greater than or equal to said duplicate acknowledgement threshold.

15 15. The network device-based method of Claim 14 further comprising:

20 analyzing a size of said congestion window.

16 The network device-based method of Claim 15 further comprising:

25 resizing said congestion window upon said analyzing said size of said congestion window showing said size is greater than a predefined size.

30 17. The network device-based method of Claim 12 further comprising:

35 analyzing a size of said congestion window upon said comparing said excess number of duplicate acknowledgements with a duplicate acknowledgement threshold indicating that said excess number of duplicate acknowledgements is less than said duplicate acknowledgement threshold.

18 The network device-based method of Claim 17
further comprising:

5 resizing said congestion window upon said
analyzing said size of said congestion window
showing said size is greater than a predefined
size.

19. The network device-based method of Claim 12
wherein said method is included in Transmission Control
10 Protocol congestion avoidance.

20. A transmission control protocol method
comprising:

15 performing a TCP fast recovery process; and
performing a TCP fast recovery extended
process upon receiving acknowledgement of receipt
of new data in said TCP fast recovery process.

21. A network device comprising:
20 a processor; and
a memory coupled to said processor, and
storing a fast recovery extended method wherein
upon execution of said fast recovery extended
method by said processor a fast recovery process
25 is extended.

22. The network device of Claim 21, wherein said
fast recovery extended method further comprises:

30 determining, upon receiving acknowledgement
of receipt of new data by said network device, an
excess number of duplicate acknowledgements based
upon a count of consecutive duplicate
acknowledgement packets;

35 taking a network packet transmission recovery
action based upon said excess number of duplicate
acknowledgements; and

storing said excess number of duplicate acknowledgements in said memory as a number of duplicate acknowledgements.

5 23. The network device of Claim 22, wherein said fast recovery extended method further comprises:

 determining whether a congestion window is inflated prior to said determining an excess number of duplicate acknowledgements.

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 24. The network device of Claim 22, wherein said taking a network packet transmission recovery action further comprises:

 deflating a congestion window upon said value
15 of said excess number of duplicate acknowledgements in bytes being less than a number of bytes in a transmission control protocol sender segment.

20 25. The network device of Claim 22 wherein said taking a network packet transmission recovery action further comprises:

 optimizing a size of a congestion window to
25 match a reduction in a quantity of unacknowledged data upon said excess number of duplicate acknowledgements being greater than a TCP sender segment.

30 26. The network device of Claim 22 wherein said taking a network packet transmission recovery action further comprises:

 comparing said excess number of duplicate acknowledgements with a duplicate acknowledgement threshold.

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 27. The network device of Claim 26 wherein said taking a network packet transmission recovery action further comprises:

performing a fast retransmit upon said
comparing said excess number of duplicate
acknowledgements with a duplicate acknowledgement
threshold indicating that said excess number of
5 duplicate acknowledgements is greater than or
equal to said duplicate acknowledgement threshold.

28. The network device of Claim 27, wherein said
taking a network packet transmission recovery action
10 further comprises:

analyzing a size of a congestion window.

29. The network device of Claim 28, wherein said
taking a network packet transmission recovery action
15 further comprises:

resizing said congestion window upon said
analyzing said size of said congestion window
showing said size is greater than a predefined
size.

30. The network device of Claim 26, wherein said
taking a network packet transmission recovery action
further comprises:

analyzing a size of a congestion window upon
25 said comparing said excess number of duplicate
acknowledgements with a duplicate acknowledgement
threshold indicating that said excess number of
duplicate acknowledgements is less than said
duplicate acknowledgement threshold.

31. The network device of Claim 30, wherein said
taking a network packet transmission recovery action
further comprises:

resizing said congestion window upon said
35 analyzing said size of said congestion window
showing said size is greater than a predefined
size.

32. The network device of Claim 22 wherein said method is included in Transmission Control Protocol congestion avoidance.

5 33. A programmable memory including a fast recovery extended method wherein said fast recovery extended method upon execution comprises:

determining, upon receiving acknowledgement
of receipt of new data, an excess number of
10 duplicate acknowledgements based upon a count of
consecutive duplicate acknowledgement packets;
taking a network packet transmission recovery
action based upon said excess number of duplicate
acknowledgements; and
15 storing said excess number of duplicate
acknowledgements as a number of duplicate
acknowledgements.

20 34. A network device comprising:
means for performing a TCP fast recovery
process; and
means for performing a TCP fast recovery
extended process upon receiving acknowledgement of
receipt of new data in said TCP fast recovery
25 process.

30 35. A network device comprising:
means for determining, upon receiving
acknowledgement of receipt of new data, an excess
number of duplicate acknowledgements based upon a
count of consecutive duplicate acknowledgement
packets;
means for taking a network packet
transmission recovery action based upon said
35 excess number of duplicate acknowledgements; and
means for storing said excess number of
duplicate acknowledgements as a number of
duplicate acknowledgements.